

Algebra 2

Exponents Day 7: Multiplying & Dividing Radical Expressions

Multiply and simplify. Assume that all variables are positive.

$$\begin{aligned} & \sqrt[3]{54x^2y^3} \cdot \sqrt[3]{5x^3y^4} \\ & \sqrt[3]{27 \cdot 2 \cdot 5 \cdot x^3 \cdot x^2 \cdot y^3 \cdot y} \\ & \cancel{xy} \sqrt[3]{10x^2y} \\ & 3xy \sqrt[3]{10x^2y} \end{aligned}$$

$$\begin{aligned} 3\sqrt{7x^3} \cdot 2\sqrt{21x^3y^2} &= 6\sqrt{7 \cdot 7 \cdot 3x^6y^2} \\ &= 6 \cdot 7x^3y \sqrt{3} \\ &= 42x^3y\sqrt{3} \end{aligned}$$

$$\begin{aligned} \sqrt[3]{6} \cdot \sqrt[3]{16} &= \sqrt[3]{6 \cdot 2 \cdot 8} \\ &= 2\sqrt[3]{12} \end{aligned}$$

$$\begin{aligned} \sqrt{8y^5} \cdot \sqrt{40y^2} &= \sqrt{8 \cdot 8 \cdot 5y^7} \\ &= 8\sqrt{5y^6 \cdot y} \\ &= 8y^3\sqrt{5y} \end{aligned}$$

$$\begin{aligned} \sqrt{7x^5} \cdot \sqrt{42xy^9} &= \sqrt{7 \cdot 7 \cdot 6x^4xy^8y} \\ &= 7x^2y^4\sqrt{6xy} \end{aligned}$$

$$\begin{aligned} 4\sqrt{2x} \cdot 5\sqrt{6xy^2} &= 20\sqrt{12x^2y^2} \\ &= 20\sqrt{4 \cdot 3x^2y^2} \\ &= 20 \cdot 2|x \cdot y|\sqrt{3} \end{aligned}$$

$$\begin{aligned} 3\sqrt[3]{5y^3} \cdot 2\sqrt[3]{50y^4} &= 6\sqrt[3]{5 \cdot 25 \cdot 2y^6y} \\ &= 6\sqrt[3]{125 \cdot 2y^6y} \\ &= 6 \cdot 5y^2\sqrt[3]{2y} \\ &= 30y^2\sqrt[3]{2y} \end{aligned}$$

$$\begin{aligned} -\sqrt[3]{2x^2y^2} \cdot 2\sqrt[3]{15x^5y^7} &= -2\sqrt[3]{210x^7y^9} \\ &= -2\sqrt[3]{210x^6xy^6y^3} \\ &= -2x^2y^2\sqrt[3]{210xy^3} \end{aligned}$$

Dividing Radical Expressions

$$\frac{\sqrt{25}}{\sqrt{36}} = \frac{5}{6}$$

$$\frac{\sqrt{100}}{\sqrt{81}} = \frac{10}{9}$$

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$$\frac{\sqrt[3]{32}}{\sqrt[3]{-4}} = \sqrt[3]{\frac{32}{-4}} = \sqrt[3]{-8} = -2$$

$$\begin{aligned}\frac{\sqrt[3]{162x^5}}{\sqrt[3]{3x^2}} &= \sqrt[3]{\frac{162x^5}{3x^2}} \\ &= \sqrt[3]{27 \cdot 2 \cdot x^3} \\ &= 3x\sqrt[3]{2}\end{aligned}$$

$$\frac{\sqrt{243}}{\sqrt{27}} = \sqrt{\frac{243}{27}} = \sqrt{\frac{81}{9}} = \sqrt{9} = 3$$

$$\begin{aligned}\frac{\sqrt{12x^4}}{\sqrt{3x}} &= \sqrt{\frac{12x^4}{3x}} \\ &= 2\sqrt{x^2x} \\ &= 2|x|\sqrt{x}\end{aligned}$$

$$\begin{aligned}\frac{\sqrt[4]{1024x^{15}}}{\sqrt[4]{4x}} &= \sqrt[4]{\frac{1024x^{15}}{4x}} \\ &= 4\sqrt[4]{x^{12}x^2} \\ &= 4|x^3|\sqrt[4]{x^2}\end{aligned}$$

$$\frac{\sqrt{500}}{\sqrt{5}} = \sqrt{\frac{500}{5}} = \sqrt{100} = 10$$

$$\frac{\sqrt{48x^3}}{\sqrt{3xy^2}} = \sqrt{\frac{48x^3}{3y^2}} = \frac{4|x|}{|y|}$$

$$\begin{aligned}\frac{\sqrt{56x^5y^5}}{\sqrt{7xy}} &= \sqrt{\frac{56x^5y^5}{7xy}} \\ &= \sqrt{4 \cdot 2 \cdot x^4y^4} \\ &= 2x^2y^2\sqrt{2}\end{aligned}$$